

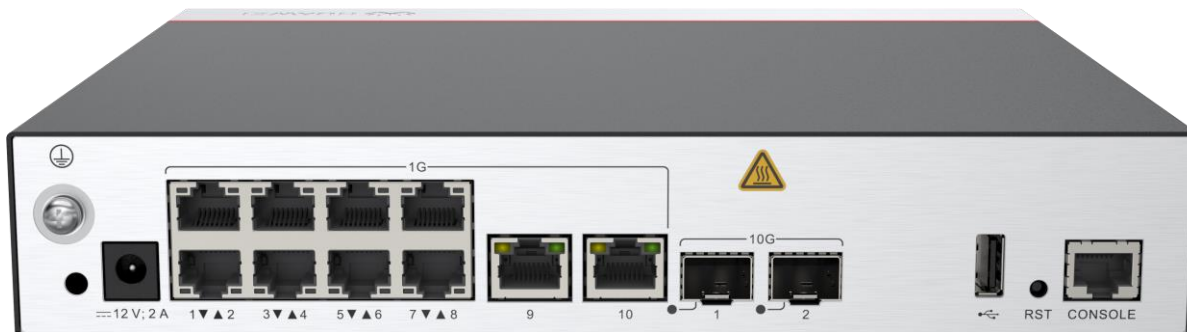


Huawei AirEngine 9501-L Wireless Access Controller Datasheet

Product Overview

The AirEngine 9501-L is a small-capacity box wireless access controller (AC) for small and medium enterprises. It can manage up to 512 access points (APs) and integrates the GE Ethernet switch function, achieving integrated access for wired and wireless users. The WLAN AC features high scalability and offers users considerable flexibility in configuring the number of managed APs. When used with Huawei's full series 802.11ax, 802.11ac and 802.11n APs, the AirEngine 9501-L can be used to construct small and medium campus networks, enterprise office networks, wireless Metropolitan Area Networks (MANs), and hotspot coverage networks.

Huawei AirEngine 9501-L wireless access controller



Product Features

Large-capacity and high-performance design

- The AirEngine 9501-L can manage up to 512 APs, meeting requirements of small and medium campuses.
- Provides 2 x 10GE optical interfaces and 10 x GE electrical interfaces, supporting up to 10 Gbit/s forwarding performance.

SmartRadio for air interface optimization

- Load balancing during smart roaming: The load balancing algorithm can work during smart roaming for load balancing detection among APs on the network after STA roaming to adjust the STA load on each AP, improving network stability.
- Intelligent DFA technology: The dynamic frequency assignment (DFA) algorithm is used to automatically detect adjacent-channel and co-channel interference, and identify any 2.4 GHz redundant radio. Through automatic inter-AP negotiation, the redundant radio is automatically switched to another mode (dual-5G AP models support 2.4G-to-5G switchover) or is disabled to reduce 2.4 GHz co-channel interference and increase the system capacity.
- Intelligent conflict optimization technology: The dynamic enhanced distributed channel access (EDCA) and airtime scheduling algorithms are used to schedule the channel occupation time and service priority of each user. This ensures that each user is assigned relatively equal time for using channel resources and user services are scheduled in an orderly manner, improving service processing efficiency and user experience.

Various roles

- The AirEngine 9501-L has a built-in AAA server and can provide Portal authentication for users, reducing customer investment.

Flexible networking

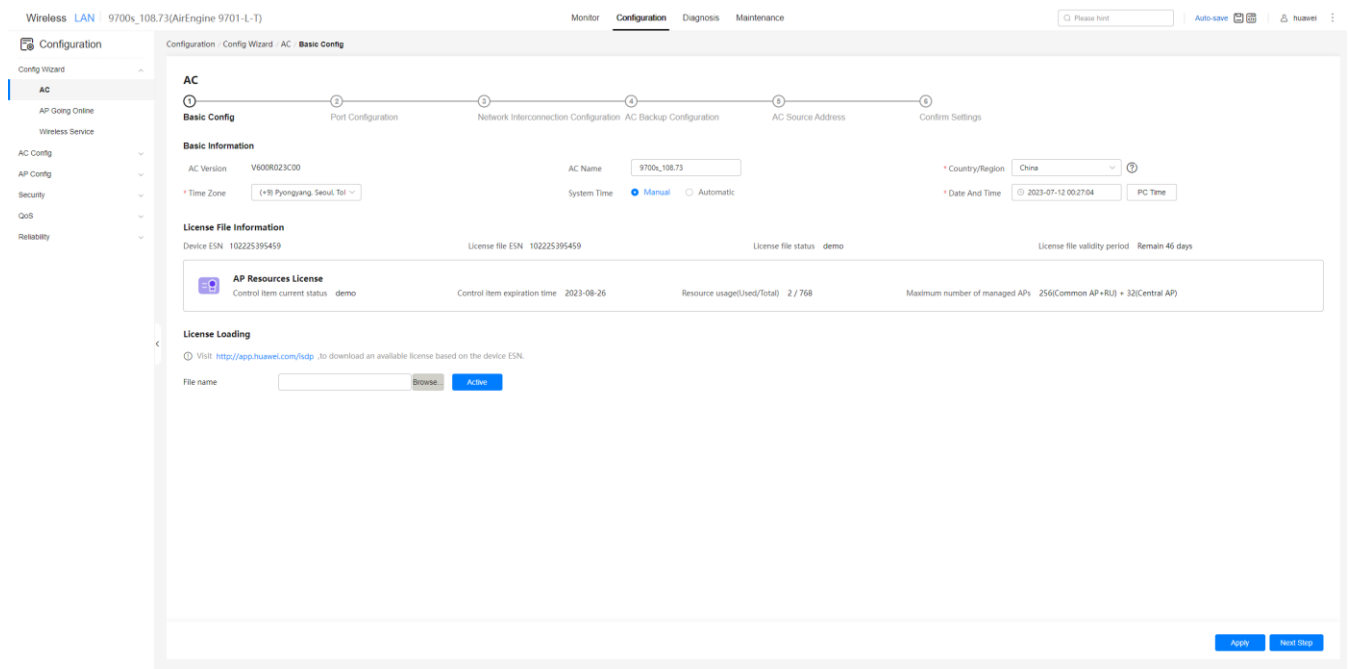
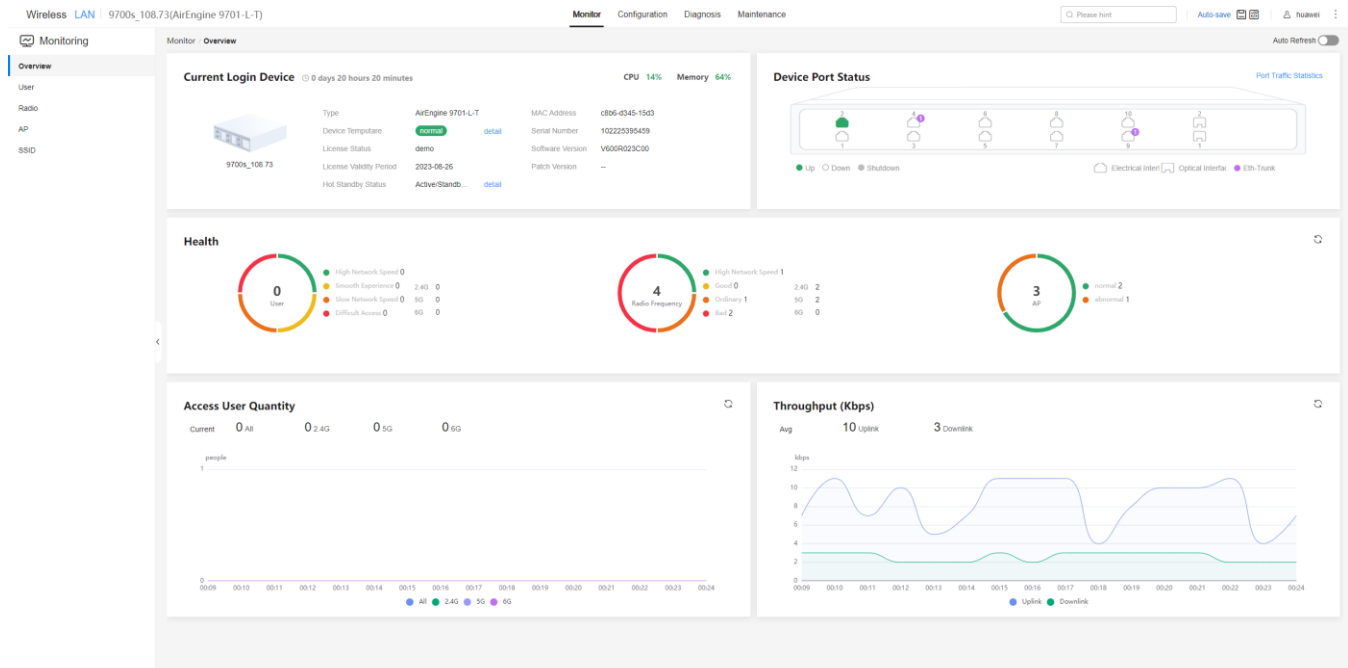
- The WLAN AC can be deployed in inline, bypass, and bridge, and supports both centralized and local forwarding.
- The WLAN APs can be connected across a Layer 2 or Layer 3 network.
- The WLAN AC is compatible with Huawei full-series 802.11n, 802.11ac and 802.11ax APs and supports hybrid networking of 802.11n, 802.11ac and 802.11ax APs for simple scalability.

Comprehensive reliability design

- Supports AC 1+1 HSB, ensuring uninterrupted services.
- Supports port backup based on the Link Aggregation Control Protocol (LACP) or Multiple Spanning Tree Protocol (MSTP).

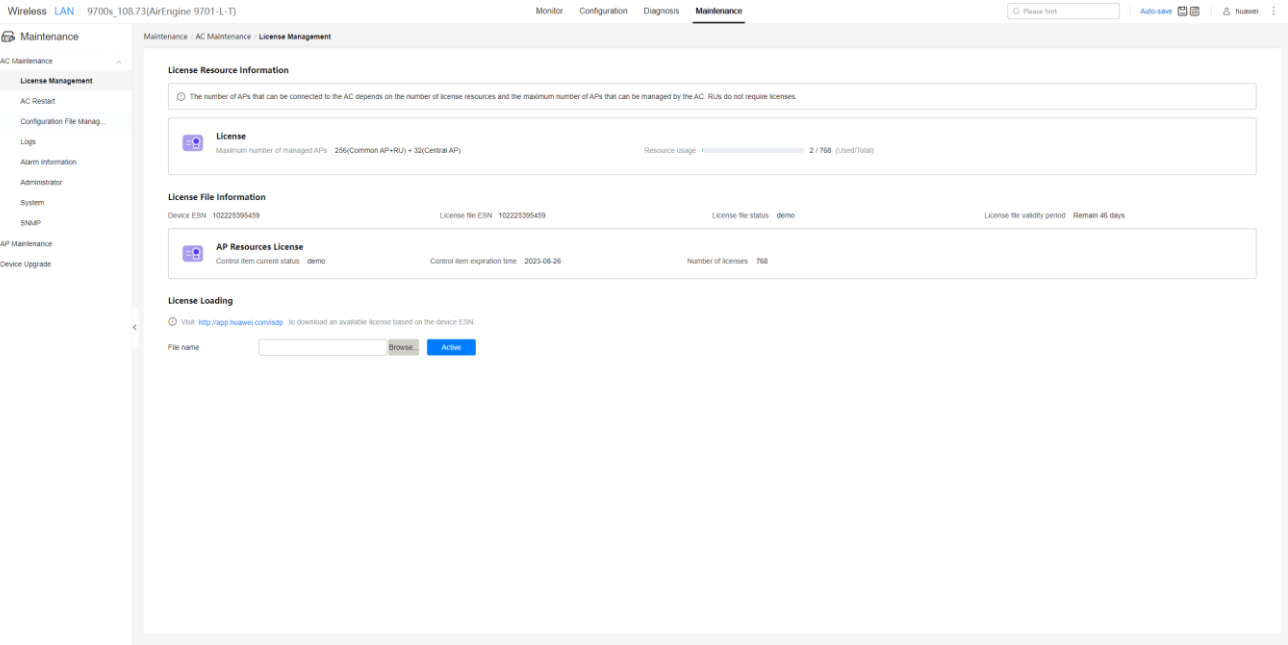
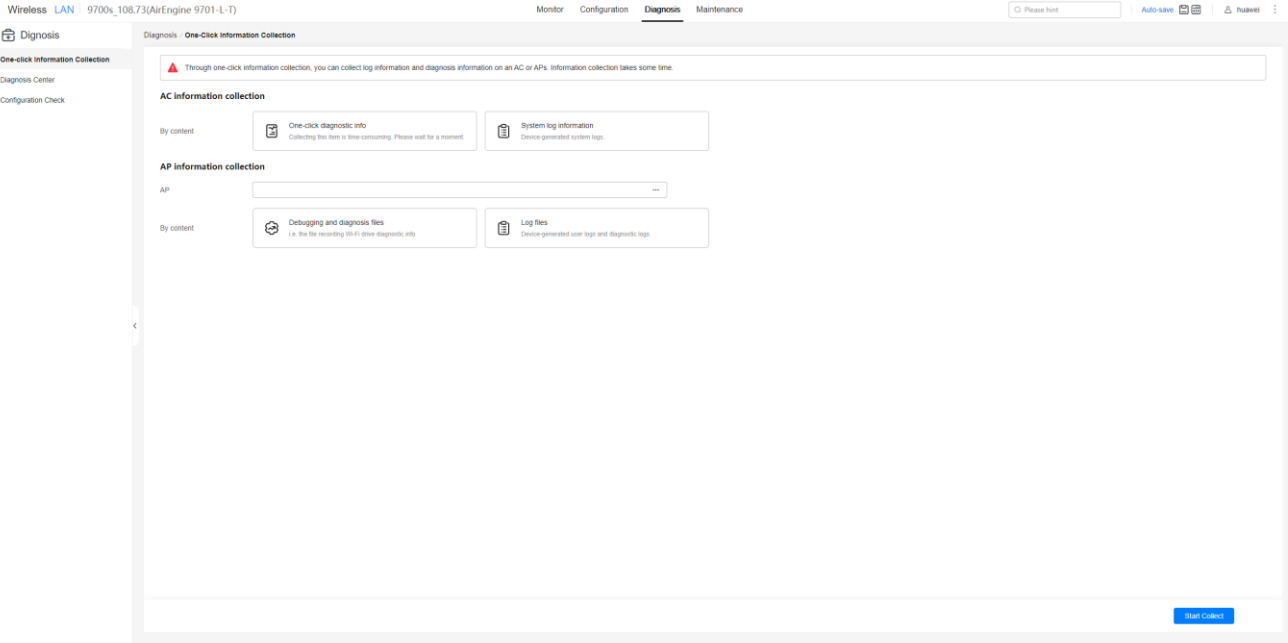
Built-in visualized network management platform

The AirEngine 9501-L has a built-in web system that is easy to configure and provides comprehensive monitoring.



Solving 80% of common network problems.

- The web system supports real-time and periodic diagnosis from the dimensions of APs and WLAN ACs, and provides feasible suggestions for troubleshooting the faults.



AirEngine 9501-L Features

Switching and forwarding features

Feature		Description
Ethernet features	Ethernet	<p>Operating modes of full duplex, half duplex, and auto-negotiation</p> <p>Rates of an Ethernet interface: 10 Mbit/s, 100 Mbit/s, 1000 Mbit/s, and auto-negotiation</p> <ul style="list-style-type: none"> • Flow control on interfaces • Jumbo frames • Link aggregation • Load balancing among links of a trunk • Interface isolation and forwarding restriction

Feature		Description
		<ul style="list-style-type: none"> Broadcast storm suppression
	VLAN	Access modes of access, trunk, and hybrid Default VLAN VLAN pool
	MAC	Automatic learning and aging of MAC addresses Static, dynamic, and blackhole MAC address entries Packet filtering based on source MAC addresses Interface-based MAC learning limiting
	ARP	Static and dynamic ARP entries ARP in a VLAN Aging of ARP entries
	LLDP	LLDP
Ethernet loop protection	MSTP	STP RSTP MSTP BPDU protection, root protection, and loop protection Partitioned STP
IPv4 forwarding	IPv4 features	ARP and RARP ARP proxy Auto-detection
	Unicast routing features	Static route RIP-1 and RIP-2 OSPF BGP IS-IS Routing policies and policy-based routing URPF check DHCP server and relay DHCP snooping
IPv6 forwarding	IPv6 features	ND protocol
	Unicast routing features	Static route RIPng OSPFv3 BGP4+ IS-IS IPv6
Device reliability	BFD	BFD
Layer 2 multicast features	Layer 2 multicast	IGMP snooping Prompt leave Multicast traffic control Inter-VLAN multicast replication
QoS features	Traffic classification	Traffic classification based on the combination of the L2 protocol header, IP 5-

Feature	Description
	<p>tuple, and 802.1p priority</p> <p>Action</p> <ul style="list-style-type: none"> Access control after traffic classification Traffic policing based on traffic classification Re-marking packets based on traffic classifiers Class-based packet queuing Associating traffic classifiers with traffic behaviors <p>Queue scheduling</p> <ul style="list-style-type: none"> PQ scheduling DRR scheduling PQ+DRR scheduling WRR scheduling PQ+WRR scheduling <p>Congestion avoidance</p> <ul style="list-style-type: none"> SRED WRED <p>Application control</p> <ul style="list-style-type: none"> Smart Application Control (SAC)
Configuration and maintenance	<p>Terminal service</p> <ul style="list-style-type: none"> Configurations using command lines Error message and help information in English Login through console and Telnet terminals Send function and data communications between terminal users <p>File system</p> <ul style="list-style-type: none"> File systems Directory and file management File uploading and downloading using FTP and TFTP <p>Debugging and maintenance</p> <ul style="list-style-type: none"> Unified management over logs, alarms, and debugging information Electronic labels User operation logs Detailed debugging information for network fault diagnosis Network test tools such as traceroute and ping commands Interface mirroring and flow mirroring <p>Version upgrade</p> <ul style="list-style-type: none"> Device software loading and online software loading BIOS online upgrade In-service patching
Security and management	<p>Network management</p> <ul style="list-style-type: none"> ICMP-based ping and traceroute SNMPv1, SNMPv2c, and SNMPv3 Standard MIB RMON Packet Conservation Algorithm for Internet 2.0 (iPCA 2.0), flow detection based on applications, 5-tuple, and flows <p>System security</p> <ul style="list-style-type: none"> Different user levels for commands, preventing unauthorized users from accessing device SSHv2.0 RADIUS and HWTACACS authentication for login users ACL filtering DHCP packet filtering (with the Option 82 field)

Feature	Description
	<p>Local attack defense function that can protect the CPU and ensure that the CPU can process services</p> <p>Defense against control packet attacks</p> <p>Defenses against attacks such as source address spoofing, Land, SYN flood (TCP SYN), Smurf, ping flood (ICMP echo), Teardrop, broadcast flood, and Ping of Death attacks</p>

Wireless networking capabilities

Feature	Description
Networking between APs and WLAN ACs	<p>APs and WLAN ACs can be connected through a Layer 2 or Layer 3 network. APs can be directly connected to a WLAN AC.</p> <p>APs are deployed on a private network, while WLAN ACs are deployed on the public network to implement NAT traversal.</p> <p>WLAN ACs can be used for Layer 2 bridge forwarding or Layer 3 routing.</p> <p>WAN authentication escape is supported between APs and WLAN ACs. In local forwarding mode, this feature retains the online state of existing STAs and allows access of new STAs when APs are disconnected from WLAN ACs, ensuring service continuity.</p>
Forwarding mode	<p>Direct forwarding (distributed forwarding or local forwarding)</p> <p>Tunnel forwarding (centralized forwarding)</p> <p>Centralized authentication and distributed forwarding</p> <p>In direct forwarding mode, user authentication packets support tunnel forwarding.</p> <p>Tunnel forwarding + EoGRE tunnel</p>
WLAN AC discovery	<p>An AP can obtain the device's IP address in any of the following ways:</p> <ul style="list-style-type: none"> • Static configuration • DHCP • DNS <p>The WLAN AC uses DHCP to allocate IP addresses to APs.</p> <p>DHCP relay is supported.</p> <p>On a Layer 2 network, APs can discover the WLAN AC by sending broadcast CAPWAP packets.</p>
CAPWAP tunnel	<p>Centralized CAPWAP</p> <p>CAPWAP control tunnel and data tunnel (optional)</p> <p>CAPWAP tunnel forwarding and direct forwarding in an extended service set (ESS)</p> <p>Datagram Transport Layer Security (DTLS) encryption, which is enabled by default for the CAPWAP control tunnel</p> <p>Heartbeat detection and tunnel reconnection</p>
Active and standby WLAN ACs	<p>Enables and disables the switchback function.</p> <p>Supports 1+1 hot backup.</p> <p>NOTE</p> <p><i>In 1+1 VRRP HSB mode, WLAN ACs share one virtual IP address, simplifying the network topology.</i></p> <p>Supports wireless configuration synchronization between WLAN ACs.</p>

AP management

Feature	Description
AP access control	<p>Displays MAC addresses or SNs of APs in the whitelist.</p> <p>Adds a single AP or multiple APs (by specifying a range of MAC addresses or SNs) to the whitelist.</p> <p>Automatically discovering and manually confirming APs.</p> <p>Automatically discovering APs without manually confirming them.</p>
AP profile management	<p>Specifies the default AP profile that is applied to automatically discovered APs.</p>
AP group management	<p>The AP group function is used to configure multiple APs in batches. When multiple APs managed by a WLAN AC require the same configurations, you can add these APs to one AP group and configure the AP group to complete AP configuration.</p>
AP region management	<p>Supports three AP region deployment modes:</p> <ul style="list-style-type: none">• Distributed deployment: APs are deployed independently. An AP is equivalent to a region and does not interfere with other APs. APs work at the maximum power and do not perform radio calibration.• Common deployment: APs are loosely deployed. The transmit power of each radio is less than 50% of the maximum transmit power.• Centralized deployment: APs are densely deployed. The transmit power of each radio is less than 25% of the maximum transmit power. <p>Specifies the default region to which automatically discovered APs are added.</p>
AP type management	<p>Manages AP attributes including the number of interfaces, AP types, number of radios, radio types, maximum number of virtual access points (VAPs), maximum number of associated users, and radio gain (for APs deployed indoors).</p> <p>Provides default AP types.</p>
Network topology management	<p>Supports LLDP topology detection.</p>
AP working mode management	<p>Supports AP working mode switchover. The AP working mode can be switched to the Fat or cloud mode on the AC.</p>

Radio management

Feature	Description
Radio profile management	<p>The following parameters can be configured in a radio profile:</p> <ul style="list-style-type: none">• Radio working mode and rate• Automatic or manual channel and power adjustment mode• Radio calibration interval• The radio type can be set to 802.11b, 802.11b/g, 802.11b/g/n, 802.11g, 802.11n, 802.11g/n, 802.11a, 802.11a/n, 802.11ac, or 802.11ax. <p>You can bind a radio to a specified radio profile.</p> <p>Supports MU-MIMO.</p>
Unified static configuration of parameters	<p>Radio parameters such as the channel and power of each radio are configured on the WLAN AC and then delivered to APs.</p>
Dynamic management	<p>APs can automatically select working channels and power when they go online.</p> <p>In an AP region, APs automatically adjust working channels and power in the event of signal interference:</p>

Feature	Description
	<ul style="list-style-type: none"> Partial calibration: The optimal working channel and power of a specified AP can be adjusted. Global calibration: The optimal working channels and power of all the APs in a specified region can be adjusted. <p>When an AP is removed or goes offline, the WLAN AC increases the power of neighboring APs to compensate for the coverage hole.</p> <p>Automatic selection and calibration of radio parameters in AP regions are supported.</p>
Enhanced service capabilities	<p>Band steering: Enables terminals to preferentially access the 5G frequency band, achieving load balancing between the 2.4G and 5G frequency bands.</p> <p>Smart roaming: Enables sticky terminals to roam to APs with better signals.</p> <ul style="list-style-type: none"> 802.11k and 802.11v smart roaming 802.11r fast roaming (≤ 50 ms)

WLAN service management

Feature	Description
ESS management	<p>Allows you to enable SSID broadcast, set the maximum number of access users, and set the association aging time in an ESS.</p> <p>Isolates APs at Layer 2 in an ESS.</p> <p>Maps an ESS to a service VLAN.</p> <p>Associates an ESS with a security profile or a QoS profile.</p> <p>Enables IGMP for APs in an ESS.</p> <p>Supports Chinese SSIDs.</p>
VAP-based service management	<p>Adds multiple VAPs at a time by binding radios to ESSs.</p> <p>Displays information about a single VAP, VAPs with a specified ESS, or all VAPs.</p> <p>Supports configuration of offline APs.</p> <p>Creates VAPs according to batch delivered service provisioning rules in automatic AP discovery mode.</p>
Service provisioning management	<p>Supports service provisioning rules configured for a specified radio of a specified AP type.</p> <p>Adds automatically discovered APs to the default AP region. The default AP region is configurable.</p> <p>Applies a service provisioning rule to a region to enable APs in the region to go online.</p>
Multicast service management	<p>Supports IGMP snooping.</p> <p>Supports IGMP proxy.</p>
Load balancing	<p>Performs load balancing among radios in a load balancing group.</p> <ul style="list-style-type: none"> Supports two load balancing modes: <ul style="list-style-type: none"> Based on the number of STAs connected to each radio Based on the traffic volume on each radio

WLAN user management

Feature	Description
Address allocation of wireless users	Functions as a DHCP server to assign IP addresses to wireless users.

Feature	Description
WLAN user management	<p>Supports user blacklist and whitelist.</p> <p>Controls the number of access users:</p> <ul style="list-style-type: none"> • Based on APs • Based on SSIDs <p>Logs out users in any of the following ways:</p> <ul style="list-style-type: none"> • Using RADIUS DM messages • Using commands <p>Supports various methods to view information:</p> <ul style="list-style-type: none"> • Allows you to view the user status by specifying the user MAC address, AP ID, radio ID, or WLAN ID. • Displays the number of online users in an ESS, AP, or radio. • Collects packet statistics on air interface based on user.
WLAN user roaming	<p>Supports intra-AC Layer 2 roaming.</p> <p>NOTE</p> <p><i>Users can roam between APs connected to different physical ports on a WLAN AC.</i></p> <p>Supports inter-VLAN Layer 3 roaming on a WLAN AC.</p> <p>Supports roaming between WLAN ACs.</p> <p>Authenticates users who request to reassociate with the WLAN AC and rejects the requests of unauthorized users.</p> <p>Delays clearing user information after a user goes offline so that the user can rapidly go online again.</p>

WLAN security

Feature	Description
WLAN security profile management	Manages authentication and encryption modes using WLAN security profiles.
Authentication modes	<p>Open system authentication with no encryption</p> <p>WEP authentication/encryption</p> <p>WPA/WPA2/WPA3 authentication and encryption:</p> <ul style="list-style-type: none"> • WPA/WPA2-PSK+TKIP • WPA/WPA2-PSK+CCMP • WPA/WPA2-802.1X+TKIP • WPA/WPA2-802.1X+CCMP • WPA3-802.1X+GCMP512 • WPA/WPA2-PSK+TKIP-CCMP • WPA/WPA2-802.1X+TKIP-CCMP <p>WPA/WPA2-PPSK authentication and encryption</p> <p>WPA3-SAE+CCMP authentication and encryption</p> <p>WAPI authentication and encryption:</p> <ul style="list-style-type: none"> • Supports centralized WAPI authentication. • Supports three-certificate WAPI authentication, which is compatible with traditional two-certificate authentication. • Issues a certificate file together with a private key. <p>Allows users to use MAC addresses as accounts for authentication by the RADIUS</p>

Feature	Description
	<p>server.</p> <p>Portal authentication:</p> <ul style="list-style-type: none"> • Authentication through an external Portal server <p>802.1X authentication:</p> <ul style="list-style-type: none"> • Authentication through an external 802.1X server. •
Combined authentication	<p>Combined MAC authentication:</p> <ul style="list-style-type: none"> • PSK+MAC authentication <p>MAC+portal authentication:</p> <ul style="list-style-type: none"> • MAC authentication is used first. When MAC authentication fails, portal authentication is used.
AAA	<p>Local authentication/local accounts (MAC addresses and accounts)</p> <p>RADIUS authentication</p> <p>Multiple authentication servers:</p> <ul style="list-style-type: none"> • Supports backup authentication servers. • Specifies authentication servers based on the account. • Configures authentication servers based on the account. • Binds user accounts to SSIDs.
Security isolation	<p>Port-based isolation</p> <p>User group-based isolation</p> <ul style="list-style-type: none"> •
Authority control	<ul style="list-style-type: none"> • ACL limit based on the following: • Port • User group • User
Other security features	<ul style="list-style-type: none"> • SSID hiding • IP source guard: • Configures IP and MAC binding entries statically. • Generates IP and MAC binding entries dynamically.

WLAN QoS

Feature	Description
WMM profile management	<p>Enables or disables Wi-Fi Multimedia (WMM).</p> <p>Allows a WMM profile to be applied to radios of multiple APs.</p>
Traffic profile management	<p>Manages traffic from APs and maps packet priorities according to traffic profiles.</p> <p>Applies a QoS policy to each ESS by binding a traffic profile to each ESS.</p>
AC traffic control	<p>Manages QoS profiles.</p> <p>Uses ACLs to perform traffic classification.</p> <p>Limits incoming and outgoing traffic rates for each user based on inbound and outbound CAR parameters.</p> <p>Limits the traffic rate based on ESSs or VAPs.</p>

Feature	Description
AP traffic control	Controls traffic of multiple users and allows users to share bandwidth. Limits the rate of a specified VAP.
Packet priority configuration	Sets the QoS priority (IP precedence or DSCP priority) for CAPWAP control channels. Sets the QoS priority for CAPWAP data channels: <ul style="list-style-type: none"> Allows you to specify the CAPWAP header priority. Maps 802.1p priorities of user packets to ToS priorities of tunnel packets.
Airtime fair scheduling	Allocates equal time to users for occupying the channel, which improves users' Internet access experience.

Physical Specifications

Feature	Description
Dimensions (H x W x D)	43.6 mm x 210 mm x 250 mm
Interface type	2 x 10G (SFP+) + 10 x GE
Maximum power consumption	25 W
Weight	1.9 kg
Operating temperature and altitude	-60 m to +1800 m: 0°C to 45°C 1800 m to 5000 m: Temperature decreases by 1°C every time the altitude increases 220 m.
Relative humidity	5% RH to 95% RH, noncondensing
Power modules	AC/DC adapter

Performance Specifications

Feature	Description
Number of managed APs	512 NOTE <i>The initial management capacity is 256 APs, which can be expanded to 512 APs by upgrading the RTU license.</i> <i>The RUs managed by the WLAN AC do not occupy the AC's license resources. However, the total number of managed common APs and RUs cannot exceed the upper limit allowed by the AC.</i>
Number of access users	10K NOTE <i>The maximum number of access users varies depending on the authentication mode.</i>
Number of MAC address entries	16384
Forwarding capability	10 Gbit/s
Number of VLANs	4096
Number of routing entries	<ul style="list-style-type: none"> IPv4: 256

Feature	Description
	<ul style="list-style-type: none"> IPv6: 256
Number of ARP entries	16384
Number of multicast forwarding entries	256
Number of DHCP IP address pools	128 IP address pools, each of which contains a maximum of 65536 IP addresses
Number of local accounts	1024
Number of ACLs	4096

Standards compliance

Item	Description
Safety standards	IEC60950-1 UL60950-1 CSA C22.2#60950-1 EN60950-1 AS/NZS 60950.1 GB 4943
EMC standards	FCC Part15B ETSI EN 300 386 IEC61000-4-11 IEC 61000-4-4 IEC61000-4-2 IEC61000-4-3 IEC61000-4-5 IEC61000-4-6 IEC 61000-3-2 IEC 61000-3-3 AS/NZS CISPR 32 EN55032/EN55024 ICES-003 GB9254
RoHS	Directive 2002/95/EC & 2011/65/EU
Reach	Regulation 1907/2006/EC
WEEE	Directive 2002/96/EC & 2012/19/EU

More Information

For more information about Huawei WLAN products, visit <http://www.huawei.com> or contact Huawei's local sales office.

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